

ENGINE CONTROL

SYSTEM OUTLINE

THIS SYSTEM UTILIZES AN ECU AND MAINTAINS OVERALL CONTROL OF THE ENGINE, TRANSMISSION AND SO ON. AN OUTLINE OF THE ENGINE CONTROL IS EXPLAINED HERE.

1. INPUT SIGNALS

- (1) WATER TEMP. SIGNAL CIRCUIT
THE WATER TEMP. SENSOR DETECTS THE ENGINE COOLANT TEMP. AND HAS A BUILT-IN THERMISTOR WITH A RESISTANCE WHICH VARIES ACCORDING TO THE WATER TEMP. THE WATER TEMP. IS INPUT INTO **TERMINAL THW** OF ENGINE CONTROL ECU AS A CONTROL SIGNAL.
- (2) INTAKE AIR TEMP. SIGNAL CIRCUIT
THE INTAKE AIR TEMP. SENSOR IS INSTALLED IN THE AIR FLOW METER AND DETECTS THE INTAKE AIR TEMP., WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL THA** OF ENGINE CONTROL ECU.
- (3) OXYGEN SENSOR SIGNAL CIRCUIT
THE OXYGEN DENSITY IN THE EXHAUST EMISSION IS DETECTED AND INPUT AS A CONTROL SIGNAL FROM THE OXYGEN SENSOR MAIN (FOR LEFT AND RIGHT BANK) TO **TERMINALS OXL1, OXR1** OF THE ECU AND FROM THE OXYGEN SENSOR SUB (FOR LEFT AND RIGHT BANK) TO **TERMINAL OXL2, OXR2** OF THE ECU.
TO STABILIZE DETECTION PERFORMANCE BY THE OXYGEN SENSOR, THE OXYGEN SENSOR IS WARMED. THIS HEATER IS ALSO CONTROLLED BY THE ECU (HT1, HT2).
- (4) RPM SIGNAL CIRCUIT
CAMSHAFT POSITION IS DETECTED BY THE CAM POSITION SENSOR (FOR LEFT AND RIGHT BANK) INSTALLED IN THE DISTRIBUTOR HOUSING AND IT'S SIGNAL IS INPUT TO **TERMINALS G1, G2** OF ECU AS A CONTROL SIGNAL. ALSO, THE ENGINE RPM IS DETECTED BY THE ENGINE SPEED SENSOR INSTALLED IN THE CYLINDER BLOCK AND THE SIGNAL IS INPUT INTO **TERMINAL NE** OF ECU AS A CONTROL SIGNAL.
- (5) THROTTLE SIGNAL CIRCUIT
THE THROTTLE POSITION SENSOR DETECTS THE THROTTLE VALVE OPENING ANGLE AS A CONTROL SIGNAL, WHICH IS INPUT INTO **TERMINAL VTA1** OF THE ECU. WHEN THE VALVE IS COMPLETELY CLOSED, THE CONTROL SIGNAL IS INPUT INTO **TERMINAL IDL1**.
- (6) VEHICLE SPEED CIRCUIT
THE VEHICLE SPEED IS DETECTED BY SPEED SENSOR NO. 1 INSTALLED IN THE TRANSMISSION AND THE SIGNAL IS INPUT TO **TERMINAL SPD** OF THE ECU VIA THE COMB. METER.
- (7) NEUTRAL START SIGNAL CIRCUIT
THE NEUTRAL START SW DETECTS WHETHER THE SHIFT POSITION IS IN NEUTRAL OR NOT, AND THE SIGNAL IS INPUT INTO **TERMINAL NSW** OF THE ECU.
- (8) AIRCONDITIONING SW SIGNAL CIRCUIT
THE OPERATING VOLTAGE OF THE A/C MAGNETIC CLUTCH IS DETECTED AND THE SIGNAL IS INPUT INTO **TERMINAL ACMG** OF ECU AS A CONTROL SIGNAL.
- (9) BATTERY SIGNAL CIRCUIT
VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ECU. WITH THE IGNITION SW TURNED ON, THE VOLTAGE FOR ECU START-UP POWER SUPPLY IS APPLIED TO **TERMINALS +B AND +B1** OF ECU VIA EFI MAIN RELAY.
THE CURRENT FLOWING THROUGH THE **IGN** FUSE FLOWS TO **TERMINAL IGSW** OF THE ECU.
- (10) INTAKE AIR VOLUME SIGNAL CIRCUIT
INTAKE AIR VOLUME IS DETECTED BY THE AIR FLOW METER AND THE SIGNAL IS INPUT TO **TERMINAL KS** OF THE ECU AS A CONTROL SIGNAL.
- (11) STOP LIGHT SW SIGNAL CIRCUIT
THE STOP LIGHT SW IS USED TO DETECT WHETHER OR NOT THE VEHICLE IS BRAKING AND THE SIGNAL IS INPUT INTO **TERMINAL STP** OF THE ECU AS A CONTROL SIGNAL.
- (12) STA SIGNAL CIRCUIT
TO CONFIRM WHETHER THE ENGINE IS CRANKING, THE VOLTAGE APPLIED TO THE STARTER MOTOR DURING CRANKING IS DETECTED AND THE SIGNAL IS INPUT INTO **TERMINAL STA** OF THE ECU AS A CONTROL SIGNAL.
- (13) ENGINE KNOCK SIGNAL CIRCUIT
ENGINE KNOCKING IS DETECTED BY KNOCK SENSOR NO. 1 AND NO. 2 AND THE SIGNAL IS INPUT INTO **TERMINALS KNK1 AND KNK2** AS A CONTROL SIGNAL.

2. CONTROL SYSTEM

* EFI (ELECTRONIC FUEL INJECTION) SYSTEM

THE EFI SYSTEM MONITORS THE ENGINE CONDITION THROUGH THE SIGNALS INPUT FROM EACH SENSOR (INPUT SIGNALS FROM (1) TO (13) ETC.) TO THE ECU. THE BEST FUEL INJECTION TIMING IS DECIDED BASED ON THIS DATA AND THE PROGRAM MEMORIZED BY THE ECU, AND THE CONTROL SIGNAL IS OUTPUT TO **TERMINALS 10, #20, #30 AND #40** OF THE ECU TO OPERATE THE INJECTOR. (INJECT THE FUEL). THE EFI SYSTEM PRODUCES CONTROL OF FUEL INJECTION OPERATION BY THE ECU IN RESPONSE TO THE DRIVING CONDITIONS.

* ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE CONDITION THROUGH THE SIGNALS INPUT TO THE ECU FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (4) TO (13) ETC.). THE BEST IGNITION TIMING IS DECIDED ACCORDING TO THIS DATA AND THE MEMORIZED DATA IN THE ECU AND THE CONTROL SIGNAL IS OUTPUT TO **TERMINAL IGT1 AND IGT2**. THIS SIGNAL CONTROLS THE IGNITER TO PROVIDE THE BEST IGNITION TIMING FOR THE DRIVING CONDITIONS.

* FUEL PRESSURE-UP SYSTEM

THE FUEL PRESSURE-UP SYSTEM CAUSES THE VSV (FOR FUEL PRESSURE-UP) TO COME ON FOR HIGH TEMP. STARTING AND INCREASED THE FUEL PRESSURE TO IMPROVE STARTABILITY AT HIGH TEMPERATURES AND TO PROVIDE STABLE IDLING. THE ECU EVALUATES THE INPUT SIGNALS FROM EACH SENSOR ((1), (2), (4), (9) AND (10) ETC.), AND OUTPUTS CURRENT TO **TERMINAL FPU** OF ECU TO CONTROL THE VSV.

* OXYGEN SENSOR HEATER CONTROL SYSTEM

THE OXYGEN SENSOR HEATER CONTROL SYSTEM TURNS THE HEATER ON WHEN THE INTAKE AIR VOLUME IS LOW (TEMP. OF EXHAUST EMISSIONS IS LOW), AND WARMS UP THE OXYGEN SENSOR (FOR LEFT AND RIGHT BANK) TO IMPROVE DETECTION PERFORMANCE OF THE SENSOR.

THE ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (4), (9) TO (11) ETC.,) AND OUTPUTS CURRENT TO **TERMINAL HTL1, HTR2** TO CONTROL THE HEATER.

* ISC (IDLE SPEED CONTROL) SYSTEM

THE ISC SYSTEM (STEP MOTOR TYPE) INCREASES THE RPM AND PROVIDES IDLING STABILITY FOR FAST IDLE-UP WHEN THE ENGINE IS COLD, AND WHEN THE IDLE SPEED HAS DROPPED DUE TO ELECTRICAL LOAD AND SO ON. THE ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (4), (5), (8), (9), (11) ETC.), OUTPUTS CURRENT TO **TERMINAL ISC1, ISC2, ISC3 AND ISC4** TO CONTROL ISC VALVE.

* EGR CONTROL SYSTEM

THE EGR CONTROL SYSTEM DETECTS THE SIGNAL FROM EACH SENSOR (INPUT SIGNALS FROM (1), (4), (9), (10) ETC.), AND OUTPUTS CURRENT TO **TERMINAL EGR** (EX. CALIFORNIA), **EGR1, EGR2, EGR3 AND EGR4** (FOR CALIFORNIA) TO CONTROL THE EGR VALVE.

* FUEL PUMP CONTROL SYSTEM

THE COMPUTER OUTPUTS CURRENT TO **TERMINAL FPC** AND CONTROLS THE FUEL PUMP ECU AND FUEL PUMP DRIVE SPEED IN RESPONSE TO CONDITIONS.

3. DIAGNOSIS SYSTEM

WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTION IN THE ECU SIGNAL SYSTEM, THE MALFUNCTIONING SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN BE FOUND BY READING THE CODE DISPLAYED BY THE CHECKING ENGINE WARNING LIGHT.

4. FAIL-SAFE SYSTEM

WHEN A MALFUNCTION HAS OCCURRED IN ANY SYSTEM, IF THERE IS A POSSIBILITY OF ENGINE TROUBLE BEING CAUSED BY CONTINUED CONTROL BASED ON THE SIGNALS FROM THAT SYSTEM, THE FAIL-SAFE SYSTEM EITHER CONTROLS THE SYSTEM BY USING DATA (STANDARD VALUES) RECORDED IN THE ECU MEMORY OR ELSE STOPS THE ENGINE.

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